



# R-GAGE™ QT50RAF† Sensor

Radar-Based Adjustable Field Sensors for Detection of Moving and Stationary Targets



## Features

- FMCW (true-presence) radar detects moving and stationary objects
- Adjustable sensing field — ignores objects beyond the setpoint
- Sensing field is configured with simple DIP switches
- Sensing functions are unaffected by wind and air temperatures
- Sensor operates in Industrial, Scientific, and Medical (ISM) telecommunication band; no special license required
- Rugged IP67 housing withstands harsh environments

† Patent(s) issued or pending

**CAUTION . . . Make No Modifications to this Sensor**

Any modifications to this sensor not expressly approved by Banner Engineering could void the user's authority to operate the sensor. Contact the Factory for more information.

## Models

Models*	Maximum Range	Connection	Supply Voltage	Telecom Approval	Output
QT50RAF-US	15 m (49')	5-wire 2 m (6.5') Integral cable	12 to 30V dc	Telecom approved for US	Bipolar NPN/PNP DIP-switch-selectable N.O. or N.C.
QT50RAF-CA				Telecom approved for Canada	
QT50RAF-EU				Telecom approved for Europe (except France and UK) and Australia	
QT50RAF-UK				Telecom approved for UK	
QT50RAF-FR				Telecom approved for France	

\* Cabled models only are listed. For integral 5-pin Euro-style (M12) quick-disconnect fitting, add "Q" to the model number (e.g., QT50RAFQ-xx). QD models require a mating cordset; see page 4.

**WARNING . . . Not To Be Used for Personnel Protection**

Never use these products as sensing devices for personnel protection. Doing so could lead to serious injury or death.

These sensors do NOT include the self-checking redundant circuitry necessary to allow their use in personnel safety applications. A sensor failure or malfunction can cause either an energized or de-energized sensor output condition. Consult your current Banner Safety Products catalog for safety products which meet OSHA, ANSI and IEC standards for personnel protection.

# R-GAGE™ QT50RAF Radar-Based Adjustable Field Sensor

## Overview

The R-GAGE sensor emits a well-defined beam of high-frequency radio waves from an internal antenna. Some of this emitted energy reflects back to the receiving antenna. Signal processing electronics in the sensor determine the distance from the sensor to the object based on the time delay of the return signal. The sensor can be configured (via DIP switch) to sense objects up to a specific distance, ignoring objects beyond this distance (also called background suppression).

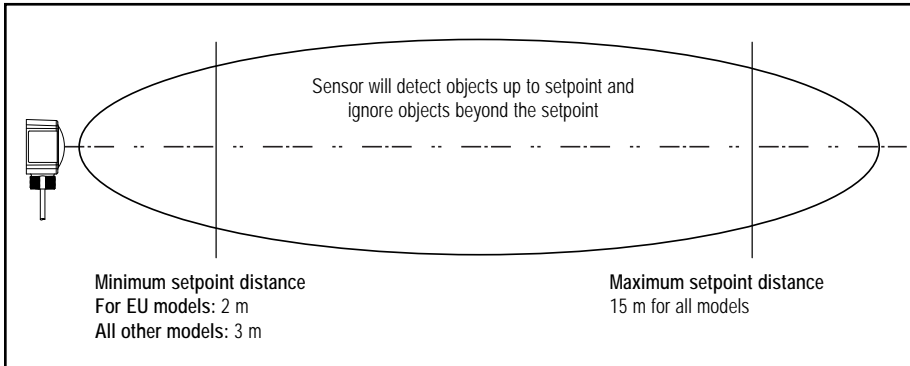


Figure 1. R-GAGE setpoint distances, minimum and maximum

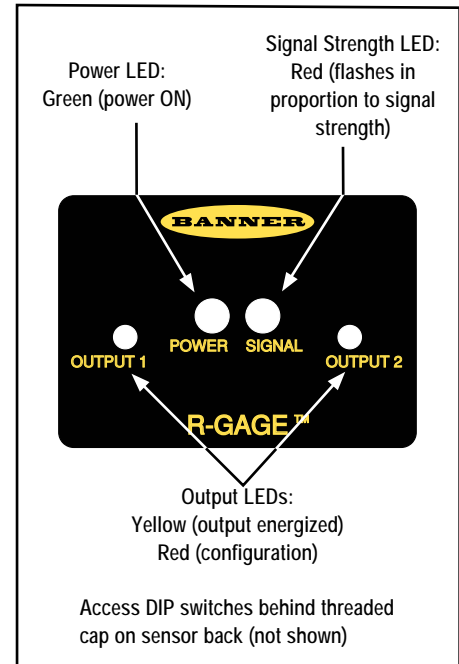


Figure 2. R-GAGE features

## Sensor Configuration

The sensing zone distance, sensitivity, and output configuration can be selected via the DIP switches on the back of the sensor.

### DIP Switch Functions

Switch	Function
1, 2, 3	Sensing distance (detects objects from sensor face to this point)
4, 5, 6	Sensitivity (higher sensitivity sees weaker objects and has a wider beam pattern)
7	Normally open/normally closed output functionality
8	Response speed

### Sensitivity Selection

Switch 4	Switch 5	Switch 6	Sensitivity	Beam Width
0	0	0	8	Wide ↓ Narrow
0	0	1	7	
0	1	0	6	
0	1	1	5	
1	0	0	4	
1	0	1	3	
1	1	0	2	
1	1	1	1	

### Sensing Distance Settings

Switch 1	Switch 2	Switch 3	Distance	
			EU Model	All Other Models
0	0	0	2 m	3 m
0	0	1	3 m	4 m
0	1	0	4 m	5 m
0	1	1	6 m	6 m
1	0	0	8 m	8 m
1	0	1	10 m	10 m
1	1	0	12 m	12 m
1	1	1	15 m	15 m

### Output Configuration

Switch 7	Normally Open/Normally Closed
0	N.O.
1	N.C.


### Response Speed

Switch 8	ON	OFF	ON/OFF
0	32 ms	68 ms	100 ms
1	258 ms	998 ms	1256 ms

# R-GAGE™ QT50RAF Radar-Based Adjustable Field Sensor

## Specifications

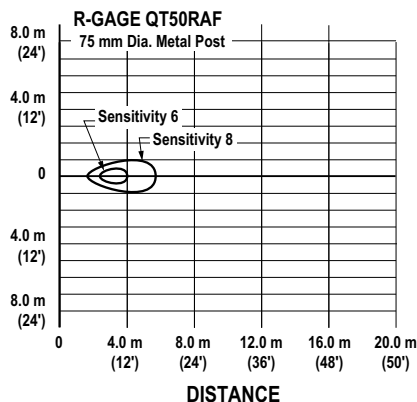
Specifications are subject to change without notice.

<b>Range</b>	The sensor is able to detect a proper object (see below) up to 15 meters, depending on target.
<b>Detectable Objects</b>	Objects containing metal, water, or similar high-dielectric materials.
<b>Operating Principle</b>	Frequency modulated continuous-wave (FMCW) radar
<b>Operating Frequency</b>	24.00 to 24.25 GHz, ISM Band (varies slightly with model, depending on national telecom regulations)
<b>Supply Voltage</b>	12 to 30V dc, less than 100 mA, exclusive of load
<b>Supply Protection Circuitry</b>	Protected against reverse polarity and transient overvoltages
<b>Delay at Power-up</b>	Less than 2 seconds
<b>Output Configuration</b>	Bipolar NPN/PNP output, 150mA; DIP switch 7 selects N.O. (default) or N.C. operation
<b>Output Protection</b>	Protected against short circuit conditions
<b>Indicators</b>	<b>Power LED:</b> Green (power ON) <b>Signal Strength LED:</b> Red, flashes in proportion to signal strength. <b>Output LEDs:</b> Yellow (output energized)/Red (configuration) See Figure 2.
<b>Adjustments</b>	DIP-switch-configurable sensitivity, sensing distance, and output configuration
<b>Construction</b>	<b>Housing:</b> ABS/polycarbonate <b>Lightpipes:</b> Acrylic <b>Access Cap:</b> Polyester
<b>Operating Temperature</b>	-40° to +65° C (-40° to +149° F)
<b>Environmental Rating</b>	IP67
<b>Connections</b>	Integral 5-wire 2 m (6.5') cable or M12 Euro-style QD fitting. QD models require a mating cordset; see page 4.
<b>Certifications</b>	 and ETSI/EN 300 440; FCC part 15; Industry Canada; for others, consult the Factory.

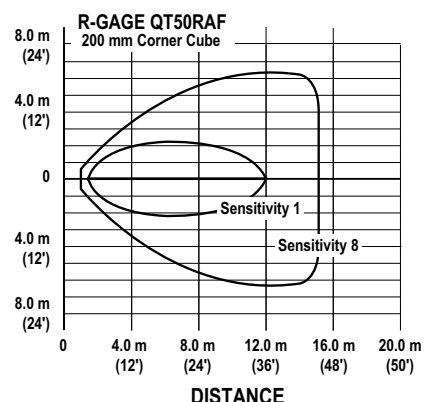
## Beam Pattern

NOTE: The effective beam pattern can be varied by adjusting the sensitivity. Increasing the sensitivity increases the diameter of the detection zone.

Typical Beam Pattern  
75 mm Dia. Metal Post

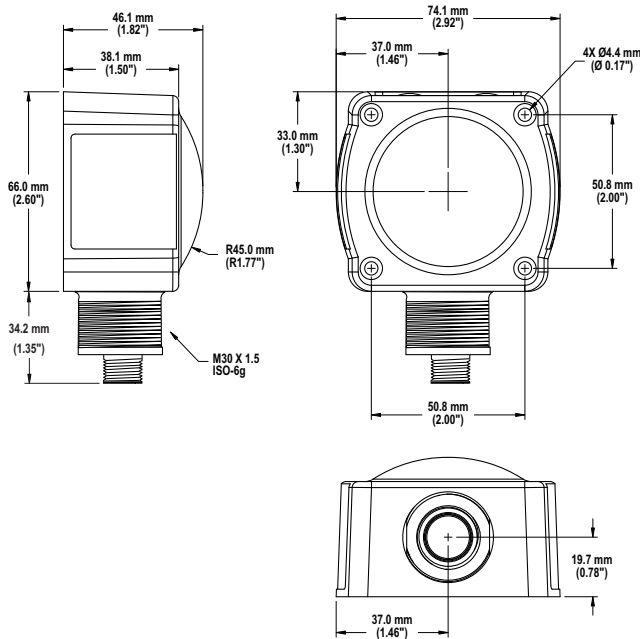


Typical Beam Pattern  
200 mm Metal Corner Cube (Similar to a Large Vehicle)

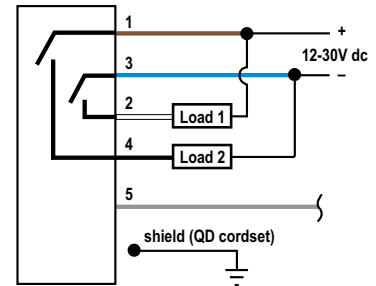


# R-GAGE™ QT50RAF Radar-Based Adjustable Field Sensor

## Dimensions



## Hookup

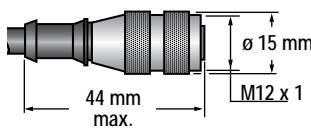
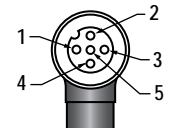


### Key



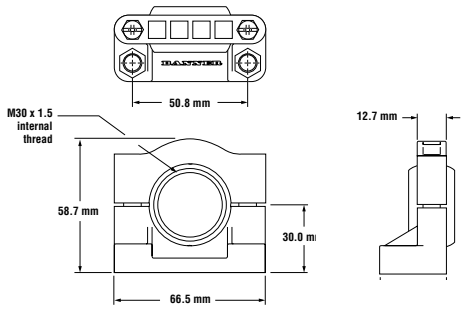
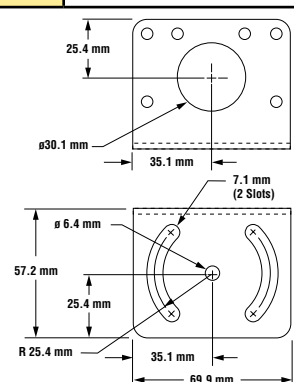
- 1 = Brown
- 2 = White
- 3 = Blue
- 4 = Black
- 5 = Gray (not used)

NOTE: It is recommended that the shield wire (QD cordsets only) be connected to earth ground or dc common. Shielded cordsets are recommended for all QD models.

## Quick-Disconnect (QD) Cordsets

Style	Model	Length	Dimensions	Pinout
5-Pin Euro-style Straight with shield	MQDEC2-506 MQDEC2-515 MQDEC2-530	2 m (6.5') 5 m (15') 9 m (30')		 <ul style="list-style-type: none"> <li>1 = Brown</li> <li>2 = White</li> <li>3 = Blue</li> <li>4 = Black</li> <li>5 = Gray (not used)</li> </ul>

## Mounting Brackets

<p><b>SMB30SC</b></p> <ul style="list-style-type: none"> <li>30 mm split clamp with swivel, black reinforced thermoplastic polyester</li> <li>Stainless steel hardware included</li> </ul> 	<p><b>SMB30MM</b></p> <ul style="list-style-type: none"> <li>30 mm, 11-gauge, stainless steel bracket with curved mounting slots for versatile orientation</li> <li>Clearance for M6 (1/4") hardware</li> </ul> 
	

**BANNER**<sup>®</sup>  
more sensors, more solutions

**WARRANTY:** Banner Engineering Corp. warrants its products to be free from defects for one year. Banner Engineering Corp. will repair or replace, free of charge, any product of its manufacture found to be defective at the time it is returned to the factory during the warranty period. This warranty does not cover damage or liability for the improper application of Banner products. This warranty is in lieu of any other warranty either expressed or implied.

P/N 135460 rev. A